REMARKS

The Examiner is thanked for the very thorough and professional Office Action. Pursuant to that action, Claims 2, 3 and 14 have been canceled and Claims 1, 9-11, 13, 15, 16 and 19 rewritten to more definitely set forth the invention and obviate the rejection. Claim 1 has been rewritten to incorporate the limitations of Claims 2 and 3. Support for the amendment of Claim 9 can be found in the Specification on page 3, lines 3-5, and in original Claim 2. Also, the dependency of Claim 15 has been changed from Claim 14 to 9 and the dependency of Claim 16 has been changed from Claim 15 to 9. In addition, Claim 19 has been amended to delete reference to SOLVESSO 100 and SOLVESSO 150. The present amendent is deemed not to introduce new matter. Claims 1, 4-7, 9-13 and 15-19 remain in the application.

Reconsideration is respectfully requested of the rejection of Claims 11 and 14-16 under 35 U.S.C. § 112, first paragraph. Support for the use of melamine resin, isocyanate and blocked isocyanate can be found in the Specification on page 7, lines 7-10, and these curing agents are now set forth in a Markush group. In addition, Claim 14 has been canceled and the dependency of Claims 15 and 16 changed so that they are now dependent on Claim 9. Further, Claim 9 has been amended to provide the proper

support for the terms in the dependent Claims 15 and 16. It is therefore believed that the rejection is no longer applicable and the rejection is now moot. Withdrawal of the rejection is accordingly respectfully requested.

Reconsideration is respectfully requested of the rejection of Claims 10, 11, 13 and 19 under 35 U.S.C. £ 112, second paragraph, as being indefinite. Claims 10 and 11 have been amended to set forth the components in proper Markush language, and Claim 13 has been amended to correct typographical errors. In addition, the reference in Claim 19 to SOLVESSO 100 and SOLVESSO 150 has been deleted. It is therefore believed that with these amendments the rejections are now moot. Withdrawal of the rejections is accordingly respectfully requested.

Reconsideration is respectfully requested of the rejection of Claims 1, 2 and 4-7 under 35 U.S.C. £ 102(b)as anticipated by or, in the alternative, under 35 U.S.C. £ 103(a) as obvious over Yamada, et al., and the rejection of Claims 9, 10 and 14-19 under 35 U.S.C. £ 102(b) as anticipated by or, in the alternative, under 35 U.S.C. £ 103(a) as obvious over Nakamura, et al.

The present invention as now claimed calls for a heat radiation shield plate comprising a metal substrate and a heat radiation shield coating film formed by applying the coating composition to the substrate (Claims 1-7). Also, Claims 9-13 and

19-19 call for a heat radiation shield coating composition comprising a binder component and a curing agent and a black pigment.

The black pigment contained in the coating composition is a calcined pigment which contains Fe_2O_3 and also Cr_2O_3 and/or Mn_2O_3 in a total amount of 20 - 100% by weight. Both independent Claims 1 and 9 contain the limitation that the black calcined pigment exhibits a reflectance of not higher than 15% relative to a radiation at any wavelength in the 400 - 700 nm visible region and a reflectance of not below 30.0% relative to a solar radiation in the 780- 2100 nm wavelength region.

The importance of the use of the black calcined pigment having these reflectance properties is illustrated in Examples 1-12 appearing on pages 13-18 of the Specification, and in the comparative examples appearing in the Specification on pages 18-21. Each of these pigments was dispersed in a binder at a composition of 20 - 40 parts by weight to obtain a coating film. Then, the spectral reflectance of each coating film containing black pigments AH, respectively, was measured by Hitachi Seisakusho Spectrophotometer in the 780 - 2100 nm near infrared region.

Based on these measured reflectances, the solar radiation reflectance of each black pigment was calculated according to the

procedure described in JIS A 5759, which is discussed on page 12, lines 17-24. Then, as described in Example 1, a coating composition was prepared and coated on an aluminum substrate test piece which was then measured for Munsell System dimensions and gloss. Further, spectral reflectance was also measured to calculate the solar radiation reflectance of the test piece from which the solar radiation reflectance of the coating film was calculated.

Thereafter, the heat radiation shielding ability of coating compositions was measured as described on pages 14, line 8, to page 15, line 7. In these tests, temperature measurements were taken to measure the heat shielding/insulating ability of the coating composition in preventing heat transfer from solar radiation across the substrate to which the coating composition has been applied.

Thereafter, numerous coating compositions were prepared as described in Examples 2-12 and comparative examples 1-12, and the measurements described above in Example 1 performed on each of these coating compositions. The results of these tests and calculations are set forth in Tables 1 and 2 of the Specification on pages 12 and 21.

The data obtained was plotted in Figs. 1, 3 and 4 and the type of test box on which the temperature was measured is

depicted in Fig. 2.

It was unexpectedly discovered by the inventors hereof that the combination of the particular black pigment, binder and curing agent coated on the test sample resulted in a saturation temperature, either at the back of the substrate (test piece) or inside the test box shown in Fig. 2 that was lower than when using the other black pigmented films as in the comparative examples.

Importantly, this difference in saturation temperature inside the test box varies depending upon the color hue of the corresponding coating films, and becomes larger, about 2-9°C, when their color hue is darker. The results of the tests and comparative tests are described in Tables 1 and 2 as well as Figs. 1 and 4. It can be seen that the inventors unexpectedly discovered that the application of the claimed coating composition of the present invention onto an exterior of a structure provides unexpectedly improved insuating properties as compared to the prior art coating compositions when the structure is subject to UV/solar radiation, i.e., the exterior of a building coated with the coating composition of the present invention.

This data also demonstrates that this coating composition can be used to absorb and/or reflect a higher degree of solar

radiation when applied to a metal substrate without a subsequent increase in the interior temperature of the building. This insulating property is particularly important since it provides a temperature difference and substantial effect on the comfort of a residential space, indoor air-conditioning efficiency in storage articles. This data also confirms that the coating films of the examples have excellent heat and solar radiation shielding capabilities.

Neither Yamada, et al. nor Nakamura, et al. disclose the heat radiation shield coating composition and heat radiation shield plate having a coating thereon in which the coating composition contains a black calcined pigment containing 20 - 100% by weight of Fe_2O_3 and also Cr_2O_3 and/or Mn_2O_3 wherein the coating composition exhibits a reflectance of not below 3.0% relative to solar radiation in the 780 - 2100 nm wavelength region and a reflectance of not higher than 15% relative to a radiation at any wavelength in the 400 nm visibe region. On the contrary, that teaching or suggestion comes only from the present application and constitutes an important element or aspect of the present invention.

The limitation that the black pigment exhibits a reflectance of not higher than 15% relative to a radiation at any wavelength in the 400 - 700 nm visible region means that the black pigment

is intentionally black because of low reflectance in the visible region. In this connection, Fig. 3 of the present application shows black pigments A and D according to the present invention exhibit low reflectance, not higher than 15% at any wavelength in the 400 - 700 nm visible region.

None of the prior art relied upon by the Examiner discloses this important limitation of the claims as amended. As the test data shows, the conventional black pigments do not exhibit a reflectance of not higher than 15% relative to a radiation at any wavelength in the 400 - 700 nm visible region.

Attached as Exhibit A is a copy of an informational article by Gil Burkhart, entitled "The Effect of IR Reflecting Black Pigment Selection On Weatherable R-PVC", presented at a technical conference in St. Louis on October 1 and 2, 1996 on pages 187-199.

As pointed out in the introduction to the Burkhart article, there are essentially three basic types of IR reflecting black pigments evaluated with regard to color and composition. One was a CI pigment black 30 (CrFeNiMn), CI, pigment green 17 CrFe, 11% Fe), and CI, pigment green 17 (CrFe, 34% Fe). These pigments exhibited a reflectance in the range of 36 - 53% at 700 nm (see Fig. 5 which shows the IR reflectance of black pigments versus the wavelength.

It can be seen that these conventional black pigments do not exhibit low reflectance, as called for in the claims herein, i.e., a reflectance not higher than 15% at any wavelength in the 401 - 700 mn visible region. The same holds true with respect to the prior art black pigments which are nowhere disclosed as having the characteristics of the black pigments of the present invention.

For these reasons, it is respectfully submitted that neither Yamada, et al. nor Nakamura, et al. anticipate or render unpatentably obvious the subject matter now called for in the claims herein.

This is particularly true in view of the unexpected discovery of the applicants herein that the calcined black pigments used in the coating composition of the present invention provides unexpectedly improved insulating properties, particularly for buildings and metal surfaces. These unexpected results can clearly be seen in the test data set forth in Tables 1 and 2 and also in the Figs. 1 and 3 and 4. Consequently, the Examiner would be justified in no longer maintaining the rejection. Withdrawal of the rejection is accordingly respectfully requested.

Reconsideration is respectfully requested of the rejection of Claims 1-7, 9-17 and 19 under 35 U.S.C. £ 103(a) as being

unpatentable over Piana in view of Ravinovitch, et al. or Modly.

There is no disclosure whatever in any of the Examiner's references taken individually or in combination of a heat radiation shield coating composition as now called for in the claims herein wherein the calcined black pigment exhibits reflectance of not below 8% relative to a solar radiation in the 760 - 2100 nm wavelength region and a reflectance of not higher than 15% relative to a radiation of any wavelength in the 400 - 700 nm visible region. On the contrary, that teaching or suggestion comes only from the present application and constitutes an important element of the present invention.

Moreover, there is no suggestion or hint in any of the references relied upon that they could be combined in the manner suggested by the Examiner to arrive at a heat shield coating composition having the reflectance characteristics as now called for in the claims herein.

As pointed out above, the attached Burkhart reference illustrates the reflectance characteristics of conventional black pigments, such as the pigments in the prior art relied upon.

None of the conventional prior art including those relied upon by the Examiner disclose a calcined black pigment having these reflective properties. The importance of these reflective properties is highlighted in the test results set forth in Tables

1 and 2 and in Figs. 1 and 3-4 which illustrate the surprising insulating properties of the coating compositions containing these calcined black pigments. For these reasons, it is respectfully submitted that the unexpected results set forth in the present application should not be ignored in evaluating the importance of this invention.

Patentable unobvious does not depend upon a showing of advantages or improvements but upon obviousness, Ex parte Parthasarathy, et al., 174 USPQ 63 (POBA, 1971). However, proof of an unexpected improvement can rebut a prima facie case of obviousness. In re Murch, 464 Fed2d 1051 (CCPA, 1972).

In the present case, it is respectfully submitted that the applicant has submitted unequivocal proof that the heat radiation shield coating composition and heat radiation shield plate of the present invention provides unexpectedly improved insulating properties. It is respectfully submitted that this test data refutes any prima facie case of obviousness based on the prior art of record. This is particularly true since the prior art of record is entirely silent as to such a coating composition having the properties of the coating composition of the present invention. Therefore, it is respectfully submitted that the Examiner would be justified in no longer maintaining this rejection. Withdrawal of the rejection is accordingly

respectfully requested.

Reconsideration is respectfully requested of the rejection of Claims 9-17 and 19 under 35 U.S.C. § 103(a) as being unpatentable over O'Neil in view of Ravinovitch, et al.

As pointed out above, none of the prior art of record, including O'Neil and Ravinovitch, et al. disclose the radiation shield coating composition and heat radiation shield plate as now called for in the claims herein. For this reason, it is respectfully submitted that the Examiner would be justified in no longer maintaining this rejection. Withdrawal of the rejection is accordingly respectfully requested.

In view of the foregoing, it is respectfully submitted that the application is now in condition for allowance, and early action and allowance thereof is accordingly respectfully requested. In the event there is any reason why the application cannot be allowed at the present time, it is respectfully requested that the Examiner contact the undersigned at the number listed below to resolve any problems.

Respectfully submitted,

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